PROCESS AREAS WORK PLAN

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SECTION 1.0
INTRODUCTION

Atlantic Richfield Company has prepared this Draft Process Areas Work Plan (Work Plan) for various mine units located in and around the former Mill and Precipitation Plant area (Process Areas) within the Yerington Mine Site. This Work Plan describes site investigation activities to be conducted pursuant to the Closure Scope of Work (SOW), the Comprehensive Environmental Response, Compensation, and Liabilities Act (CERCLA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The SOW (Brown and Caldwell, 2002a) states: "Soils in the mill/process and precipitation plant areas will be characterized with respect to their potential to pose a risk to human health or the environment. These areas include on-site process buildings, ditches, tanks and vats. Generally, soils will be analyzed for whole rock chemical analyses. The soils characterization program will be used to support the final closure plan for the process areas". The proposed soils investigations will be complemented by preliminary groundwater investigations.

Soil sample collection, materials characterization and analytical activities described in this Work Plan will support the development and evaluation of closure alternatives for process components, to be presented in a comprehensive Final Permanent Closure Plan (FPCP) for the site. The FPCP will identify mine units and components that will be subject to demolition, cover and/or removal and disposal. Any Process Area components that contain, or contained, materials that pose an ecological or human health risk will be evaluated as part of this Work Plan.

The remainder of Section 1.0 of this Work Plan describes the location and hydrologic setting of the Process Areas, previous monitoring and sampling activities, and Data Quality Objectives. Section 2.0 presents information about the construction and operational history of the Process Areas, and a description of modifications over time based on an interpretation of aerial photography and topographic maps. Section 3.0 of this Work Plan presents proposed sampling locations, sampling protocols and analyses for soils in accordance with the Draft Quality Assurance Project Plan (QAPP). Section 3.0 also presents a task-specific Job Safety Analysis in the context of the more comprehensive Health and Safety Plan developed for the Yerington Mine Site. Section 4.0 lists references cited in this Work Plan.

1.1 Location and Operational History

The Yerington Mine Site is located approximately one mile west of the town of Yerington in Lyon County, Nevada (Figure 1). The area of process components addressed in this Work Plan is located in the central portion of the mine site, as shown in Figure 2.

The Anaconda Mining Company, predecessor of the Atlantic Richfield Company, began mining operations in the early 1950s. From 1953 to 1965, operations at the site consisted of mining the Yerington Pit for copper oxide ores. The copper oxide ores were processed using a Vat Leach extraction process. The Vat Leach process involved crushing of graded, pit-mined oxide copper ore to a uniform, minus 0.5-inch size. The crushed ore was loaded into one of a row of eight large concrete leach vats where a weak sulfuric acid solution was used to produce a pregnant leach solution. This solution was passed on to precipitation cells located nearby, where copper was precipitated onto scrap iron and de-tinned cans. The barren solution then passed to iron launders where excess iron was removed, then re-acidized before re-circulating in the Leach Vats. Tailings were deposited as solids in the Oxide Tailings Area. The copper concentrate was sent off site for smelting.

In 1965, the mill and concentrator were modified to allow processing of both oxide and sulfide ores. The sulfide ore process circuit involved fine crushing and copper sulfide recovery by chemical flotation, in which lime was added to the process solution to maintain a basic pH. Sulfide tailings were conveyed as slurry to the Sulfide Tailings Area. A copper concentrate was produced from the sulfide ore, and was also shipped off site for smelting. Historic records also indicate that dump leaching of the W-3 Waste Rock dump began in 1965 where sulfuric acid was applied to the W-3 Waste Rock dump to increase copper production (Anaconda, 1965).

In 1989, Arimetco International initiated leaching operations at the mine site, with little disturbance in the Process Areas. The Arimetco Electrowinning Plant and associated process components are covered by a companion Work Plan, and are located south of the Process Areas (Figure 2). The Process Areas that are described in this Work Plan cover an area approximately 5,000 feet long and 2,000 feet wide, or about 230 acres.

1.2 Hydrologic Setting

The principal source of water in the Yerington area of Mason Valley is from the Walker River (Huxel, 1969). The East and West Walker Rivers originate in the Sierra Nevada and merge south of the mine site, from where the Walker River flows northward through the valley to Walker Gap. From Walker Gap, it turns eastward and then southeastward to Weber Reservoir and ultimately to its terminus at Walker Lake. The Walker River is the primary source of natural recharge to the alluvial ground water flow system that underlies the mine site, given that recharge from precipitation is very low (the annual average precipitation rate in the area is 5.46 inches per year; Huxel, 1969).

In general, the subsurface below the mine site consists of unconsolidated alluvial deposits derived by erosion of the uplifted mountain block of the Singatse Range and alluvial materials deposited by the Walker River. These unconsolidated deposits, collectively called the valley-fill deposits by Huxel (1969), comprise four geologic units: younger alluvium (including the lacustrine deposits of Lake Lahontan), younger fan deposits, older alluvium and older fan deposits. Lake Lahontan lacustrine deposits appear to have been removed and reworked by the Walker River as it meandered back and forth across the valley Huxel (1969). Huxel estimated that Pleistocene Lake Lahontan in Mason Valley persisted for a relatively short time and was less than 60 feet deep. Groundwater conditions at the Yerington Mine Site are the subject of a companion Work Plan.

1.3 Previous Investigations and Monitoring

Soil samples from the Process Areas have not been collected for analysis as part of previous site investigation activities. The U.S. Environmental Protection Agency (EPA, 2000), as part of site characterization activities in October 2000, collected a water sample from a “flooded, underground room” in the area of process components.

1.4 Data Quality Objectives

The Data Quality Objectives (DQOs) for field sampling and analytical activities described in this Work Plan include the collection of appropriate data to support the:

- Assessment of current ecological and human health risk associated with surface materials and process solutions, and the potential for these materials and solutions to be conveyed to possible down-wind and down-gradient receptors, respectively; and
- Development and evaluation of closure alternatives for mine closure units within the process areas at the Yerington Mine site, including the demonstration of chemical stability.

In order to ensure that data of sufficient quality and quantity are collected to meet the project objectives, the seven-step DQO process listed below was utilized to develop the activities described in this Work Plan:

- Step 1. State the Problem – Describe the problem and identify the resources available to resolve the problem;
- Step 2. Identify the Decision – Identify the questions that the study will attempt to answer;
- Step 3. Inputs to the Decision – Identify the information needed to support the decision and the measurements that need to be taken to resolve the decision statement;
- Step 4. Define the Boundaries of the Study – Specify the spatial and temporal aspects of the environmental media that the data must represent to support the decision;
- Step 5. Develop a Decision Rule – Develop unambiguous "If…then" statements that define the conditions that would trigger one of the alternative actions;
- Step 6. Specify the Limits on Decision Factors – Specify the acceptable limits on decision errors, which are used to establish performance goals for limiting uncertainty in the data; and
- Step 7 Optimize the Design for Obtaining Data – Identify the most resource-effective sampling and analysis design for generating data that are expected to satisfy the DQOs.

The problem statement (Step 1) is as follows: "Process Areas components, and potential surface and sub-surface impacts, may currently represent a risk to human health and the environment". The Process Areas contained metal-bearing solutions, petroleum products and other organic compounds which could have potentially contaminated soils with the potential to impact groundwater. Figure 3 presents the Site Conceptual Model flow diagram that depicts the relationships between potential sources, including those in the Process Areas, and potential migration pathways and receptors.

Resources available to address this problem statement include the members of the Yerington Technical Work Group (YTWG): Atlantic Richfield Company, Nevada Division of Environmental Protection (NDEP), the U.S. Environmental Protection Agency (EPA), the U.S. Bureau of Land Management (BLM), the U.S. Fish and Wildlife Service, the Yerington Paiute Indian Tribe, the Walker River Paiute Indian Tribe, the U.S. Bureau of Indian Affairs, the Walker River Irrigation District, Lyon County and the City of Yerington. The decision makers in this group include Atlantic Richfield, NDEP, BLM and the EPA.

Step 2 of the DQO process (Identify the Decision) asks the key question that this Work Plan is attempting to address: "What monitoring, sampling and analytical activities for the Process Areas will serve to meet the stated objectives of evaluating current ecological and human health risk and development of closure alternatives". The results of field monitoring and sample collection and analysis activities proposed in this Work Plan will be compared to existing information and integrated with results from site investigations for other surface mine units. These results will also be evaluated to determine if any interim actions may be necessary.

Analytical results from soil samples will be compared to analytical trigger levels to determine if further sampling should be conducted in a second phase of investigation. The proposed analytical trigger levels for soils analyses include EPA Region 9 Preliminary Remediation Goals (PRGs) for industrial sites (Table 5) and background soil concentrations, to be determined as site investigations proceed. Note that the range of background values for the Yerington area collected by Shacklette and Boerngen (1984) provide a preliminary indication of soil values at the mine site. Also note that EPA issued a "Record of Decision of Community Soils" at the Anaconda Smelter NPL Site in Anaconda, Montana in September 1996, which included alternative soil values that may be used as analytical trigger levels (e.g., the risk-based clean-up levels for arsenic at this site were 250 ml/kg for residential, 500 mg/kg for commercial/industrial and 1,000 mg/kg for recreational use).

The results of groundwater investigations associated with the Process Areas will be integrated with the soils analyses, and will provide the basis for answering this question. The criteria necessary to determine if the proposed Work Plan activities will answer this question include:

- Will the collected data adequately characterize the soils and groundwater conditions associated with the Process Areas?
- Will the collected data provide an appropriate baseline to assess the effects of closure of the Process Areas?

Step 3 of the DQO process (Identify the Inputs to the Decision) identifies the kind of information that is needed to address the question posed under Step 2. Relevant historical information includes knowledge of process facilities construction, operations and maintenance, previous field monitoring and analytical results, and the identification of potential pathways and receptors. The information obtained from review of Anaconda records, on-site maps, NDEP records and current fluid management staff, site visits, the Anaconda Collection at the American Heritage Center in Laramie, Wyoming, and the proposed field monitoring and sample collection and analytical activities described in this Process Areas Work Plan provide the inputs to address the problem statement. The majority of the inputs will result from the soil sampling and groundwater investigations proposed in this Work Plan.

Step 4 of the DQO process (Define the Boundaries of the Study) defines the spatial and temporal aspects of the field monitoring, sampling and analytical activities proposed in this Work Plan. The field and analytical activities described in this Work Plan will be implemented within the boundaries of the Process Areas shown in Figure 2. Soils sampling is anticipated to occur in one or more phases. Groundwater quality sampling of new monitoring wells is anticipated to occur on a quarterly basis, in conjunction with existing groundwater monitoring and proposed monitoring described in the Groundwater Conditions Work Plan.

Step 5 of the DQO process (Develop a Decision Rule) to determine if the proposed data collection activities will be of sufficient quantity and quality to satisfy the DQOs will be based on discussions with the decision makers of the YTWG. Atlantic Richfield anticipates that the NDEP, BLM and NDEP will review the analytical results in conjunction with Atlantic Richfield to evaluate the adequacy of the collected data. The analytical data will also be compared to the analytical trigger levels.

Step 6 of the DQO process (Specify the Limits on Decision Errors) will be based on measurement errors, rather than sampling errors, given that measurement errors will likely be the primary factors affecting any decision error. Laboratory-validated data will be required to limit measurement errors. Sampling errors will be limited, to the extent practicable, by following the procedures described in this Work Plan and in the Quality Assurance Project Plan for the site, along with regulatory agency guidelines and accepted industry practices.

Step 7 of the DQO process (Optimize the Design for Obtaining Data) has been accomplished through the review of previous Work Plan drafts and discussions with the decision makers within the YTWG. The soil and groundwater investigations associated with the Process Areas, described in this Work Plan, have been determined to be the most resource-effective sampling and analysis design through the iterative process of Work Plan development and review.

SECTION 2.0
DESCRIPTION OF PROCESS AREAS

2.1 Overall Status and Land Use

Mining and ore beneficiation operations at the mine site have ceased and, with the exception of fluid management associated with Arimetco heap leach process components (described in the Heap Leach Work Plan), the Process Areas shown in Figure 2 are no longer active. Electrical, gas, and water services to all buildings within the Process Areas have been disconnected, except for the Administration Building and the Equipment Garage. All heavy mining equipment and haul trucks have been removed from the mine site. The contents of all drums and containers in the Process Areas have been characterized and the drums and containers have been removed. This characterization and removal process is described and documented in the Phillips Services Corporation report titled "Yerington Nevada Electrowinning Fluids and Drum Removal Project Summary", dated July 30, 2003 (Appendix B). The land status of the approximate 230-acre area is also shown in Figure 2.

Table 1 provides a summary of the sampling schedule for components within the Process Areas, which are shown in detail in Figures 2, 4, 4A through 4F, and 5. Figures 6, 6A, 6B, and 6C show underground sewer, spent solution, and utility lines, and respective excavation points. Letter-designated mine units and process components, and some features without letter designations, are described below.

2.2 Process Component Descriptions, Status, and Sampling Rationale

Atlantic Richfield has identified approximately 30 buildings within the Process Areas, as shown in Figures 2, 4, 4A through 4F, 5, and 6, and listed in Table 1. These buildings were used for various purposes relating to ore processing, equipment maintenance, administration and related operational activities. All of the buildings, unless otherwise noted on the figures or in the descriptions below, are built on concrete slabs and are constructed of sheet metal. Typical construction includes concrete pavement of some sort in front of doorways or overhead doors, and some of the buildings contain attached concrete structures such as loading docks or secondary containment structures for storage tanks. The Assay Lab (F) has a partial basement at its south end. An open basement foundation also exists southwest of the Anaconda Solution Tanks (DD). In addition to buildings, concrete structures (e.g., foundations, ramps), underground utilities, sumps, and above-ground and underground storage tanks within the Process Areas will be investigated.

The following describes each individual component, including the type of past activities conducted at that component, observed structural conditions, observed surface discoloration, equipment and supplies inside buildings, overhead service entrances (doorways larger than a standard single doorway of approximately 32 inches in width), loading areas, and approximate dimensions. The term “ancillary” is used in the component descriptions to mean that the subject is not directly involved in the processing of ore. Such components are typically related to maintenance, repair, general storage, administrative, or education. In order to provide the most comprehensive and conservative approach to soil characterization, all samples, unless noted otherwise, will be submitted for the “Full Profile Analyses” which is a comprehensive list of constituents of concern, described in Section 3.1.

The following sources provided information that assisted in developing the sampling locations and rationale for types of analyses included in the Full Profile Analyses:

- Interviews with former mine personnel;
- Regulatory agency file reviews;
- Anaconda mine file reviews;
- Mackay School of Mines library records reviews;
- University of Wyoming archives;
- Site reconnaissance; and
- Review of thousands of sales receipts from 1961 to 1973 on file at the Administration building.

In accordance with EPA Guidance Document EPA QA/G-5S, “Guidance on Choosing a Sampling Design for Environmental Data Collection”, the judgmental sampling program described in this Work Plan is based on our current knowledge of the site and historic process operations. Sample locations were based on professional judgment and the information sources noted above, for the purpose of regulatory and/or remedial action, and not on random spatial design or grids for the purpose of confidence levels or probability.

The result is a comprehensive sampling of locations where soil contamination was most likely to occur (e.g., in front of doorways and entrances, near pumps and sumps, stained or topographically depressed areas, near holding tanks and secondary containment). Atlantic Richfield believes this biased sampling program will evaluate “worst-case” conditions and is appropriate because: 1) relatively small-scale components in the Process Area are under investigation; 2) in most cases, significant historical and physical information is available for each component; and 3) the objective of the investigation is to screen the Process Areas for the presence or absence of contamination at levels of concern to human health and the environment.

In general, it is likely that large equipment, materials, and supplies being transported into and out of buildings was conducted through service entrances, loading docks, or standard single doorways. Thus, the potential for contaminant impact to the surface from equipment, materials, and supplies would be greater in front of these service entrances or loading docks than along a blank wall. This rationale was applied when establishing sample locations. Sumps, pumps, and areas around components where discolored soil was observed, protruding pipes were observed, or where topographically low areas were observed (where pooling could have occurred) are also locations where the potential for impact to the surface is greater than other areas. These areas of relatively greater potential for impact were noted during site visits to the Process Areas, and sample locations were developed based on this information.

Administration Building (A)

The Administration Building is an L-shaped building of frame construction with a concrete floor, composite siding, with a floor area of approximately 9,285 square feet. The building contains offices, office storage rooms, restrooms, and a garage. It is currently being used as an office for document storage and for outside contractors overseeing fluids management. The only service entrance is a single overhead garage door on the northwest side of the building. In the parking lot approximately 50 feet from the northeast side of the Administration Building, a refilling station pump island with two pumps was removed in 1998. The mine superintendent at the time reported that no product piping was connected to the pumps when they were removed. Documentation was not found as to whether or not underground storage tanks still exist or were removed prior to the pump island removal. There is no documentation that this building was used for activities related to physical ore processing or any type of ancillary activity that involved contaminants of concern (other than the fuel refilling station). It is possible that leaded fuel may have been at some time during the operation of the former fuel station. It is not likely that PCBs are present at the former fuel station, since there is no reason to believe that significant amounts of oil were stored or used regularly in normal operations. The area in front of the overhead garage door represents an area of potential movement for equipment that could leak oil or gasoline. The former fueling station represents an area of potential impact from petroleum hydrocarbons.

Sample locations:

- one in front of the building overhead garage door.

<u>Old Tire Pile (B)</u>

Several old haul truck and vehicle tires are stored on the ground in a large pile northeast of the Process Areas, visible on Figure 4. The tire pile covers an area approximately 200 feet long by 80 feet wide. There was no discolored soil observed in the area of the tire pile, and no indication of equipment storage or repair. This area appears to have been simply a convenient location to congregate used/worn tires. There is no reason to believe that contaminants of concern were stored or used at this location.

<u>Equipment Wash Building (C)</u>

This relatively small building is next to the Truck Wash and Paint Shop (M), and has a floor area of approximately 300 square feet. The building is constructed of concrete, with a concrete floor. The northeast end of the building contains piping lines that were connected to former “cleaning solution" tanks. A concrete sump sets along the outside northeast wall of the building; the purpose of this sump is unknown. An area of dark-stained ground surface approximately two feet in diameter was observed next to the sump. It appears that this building was used to wash small portable equipment within the building. A sign mounted on the northeast wall inside the building indicates that "cleaning solution" tanks were positioned along that interior wall at one time. Cleaning solutions represent a potential source of VOCs or SVOCs, and the stained ground surface could indicate oil staining. Stained soil will be excavated, removed, and temporarily stored; the extent of excavation will be three feet in depth and five feet in diameter. After excavation, two confirmation samples will be collected in the bottom of the excavation at the sidewalls.

Sample locations:

- one in front of entrance to the building.
- one in the area of observed dark-stained ground surface.

<u>Change House (D)</u>

This building has a floor area of approximately 4,400 square foot, metal siding, and concrete floor. The building was used as a dressing room and showers and is empty except for some dry scraps of materials. There was also a small office at the southwest corner of the building, and a small entry providing access to either the office or the dressing room. A small former laboratory is present at the north corner of the building. The nature of work conducted within the lab is unknown, and no chemicals are present. No discoloration of ground surface was observed. There is no reason to believe that any contaminants other than those associated with the laboratory (small amounts of acids and lab chemicals) would be present at this location.

Sample locations:

- one in front of main doorway
- one in front of doorway to the lab

School House (E)

The School House is situated directly north of the Change House (D). The building dimensions are approximately 25 feet by 50 feet (1,250 square feet), and the construction is metal siding and roof with concrete floor. The west end of the building has an overhead service door with a concrete drive into a 15 feet by 25 feet storage area. The east end of the building has a standard 3-foot doorway. The building contains chairs and file cabinets in one half of the building and stored core samples and file storage in the other half. There are restrooms present in the building. The building, as the name implies, was used as a school. There is no reason to believe that any contaminants of concern were ever stored or used within the School House. However, two samples will be collected:

Sample locations:

- one in front of main doorway
- one in front of doorway to the lab

Assay Laboratory (F)

The Assay Laboratory building is approximately 200 feet long by 70 feet wide (13,800 square feet) and is constructed of metal walls and roof, with a concrete floor. The building contains a loading dock along the southwest, northeast, and northwest sides of the building, and a basement at the southeast end of the building that is below approximately one third of the first floor area. The loading dock is an extension of the main floor. The walls of the basement are concrete. There was a small wire-cage service elevator between the basement and main floor. The southeast end of the building was used for private offices. There are two overhead service doors along the northeast and southwest sides of the building at the center of the loading dock. The center section of the building was used as a warehouse and shop area. Various laboratory equipment are present inside the building. An assay laboratory represents a potential source of leaking acids, and it is possible that VOCs that may have been stored for use as solvents. Since the building was also used as a shop, the potential exists for leaking equipment and storage of oils and lubricants. Samples will be collected from the loading dock areas, and in front of the overhead service doors, since these represent areas where movement of materials in and out of the building occurred.

Sample locations:

- one in front of each overhead service doors,
- one from the loading dock area along the northwest side
- one from in front of the single-wide entrance.

Large Warehouse (G)

The warehouse building is approximately 150 feet long by 33 feet wide (4,950 square feet), constructed of metal walls and roof, and a concrete floor. The building contains fittings, supplies, miscellaneous scrap steel, debris, and some tools. A two-inch diameter pipe is protruding from the ground at the north corner of the building. A small area of dark-stained soil was observed at the southeast end of the building. The exact nature of items that were stored in the warehouse over time is unknown. The potential contaminants of concern are those associated with ancillary equipment storage and maintenance, including large equipment (previously stored containers of lubricant or oil) and solvents. Samples will be collected from around the building, especially in front of overhead doors and near the protruding pipe.

Sample locations:

- one in front of overhead doors,
- one next to the protruding pipe, and
- one in the stained area

Small Warehouse (H)

The small warehouse is approximately 35 feet by 40 feet (1,400 square feet), constructed of metal walls and roof with a concrete floor. There is a service entrance door along one side of the building. There are 91 used transformers and oil-filled switches being stored in the Small Warehouse, and most of the transformers have been tagged as containing PCBs. The exact nature of items that were stored in the warehouse over time is unknown. The potential contaminants of concern are those associated with the transformers and ancillary equipment storage and maintenance, including large equipment (previously stored containers of lubricant or oil) and solvents. Samples will be collected from around the building, especially in front of the doorway.

Sample locations:

- one from in front of the service entrance and
- one from the single-wide entrance

Fire Engine Storage (I)

The Fire Engine Storage building is approximately 60 feet by 35 feet (2,100 square feet), and is constructed of metal walls and roof with a concrete floor. The building was originally used to house fire-fighting equipment, fire trucks, and an ambulance. A large overhead service door opens up along one side of the building to a 40-foot wide concrete driveway. Six large used transformers are currently being stored in the Fire Engine Storage building, and some of these transformers are labeled as containing PCBs. The rest of the building is empty. There was no observed staining or discoloration of the ground surface near the building. The potential contaminants of concern are those associated with the transformers, truck storage and maintenance, including previously stored containers of lubricant or oil. Samples will be collected from around the building, especially in front of the overhead service door.

Sample locations:

- one in front of the overhead service door, and
- one from in front of the single-wide entrance

Grease Shop #1 (J)

This small storage building is approximately 20 feet by 20 feet (400 square feet) with metal walls and roof, and a concrete floor. The building was used for shop and storage activities, including, as the name implies, grease and lubricants. The building is presently empty. Stored lubricants and oils represent a potential source of PCB. Samples will be collected from around the building, especially in front of the single-wide doorway.

Sample locations:

- one sample will be collected from in front of the entrance

Truck Shop (K)

The Truck Shop is the largest ancillary building in the Process Area. The building is approximately 350 feet long, 100 feet wide over one half of its length, and 75 feet wide over the other half (35,000 square feet). The walls and roof are metal, and the floor is concrete. The south half of the building was used as a machine shop, which was metal-partitioned from the north half of the building, and the southeast portion of the building contained offices. There are overhead service doors along the northeast side of the building, which provided access to the large equipment repair shop. There were two grease pits at northern end of the machine shop, near the center of building, each measuring 4 feet wide by 30 feet long. One of these pits still exists, but has been cleaned of any liquids. All drums and containers which previously existed at the Truck Shop have been removed (Appendix B). At the northwest end of the Truck Shop, three oil tanks of approximately 3,000-gallons capacity inside concrete secondary containment are located outside the building. Dark-stained ground surface is apparent along the edge of the secondary containment. Stained ground surface is also apparent near the outside southwest wall at the northwest corner of the building, along a two-inch plastic pipeline that is installed between a large concrete secondary containment structure (no tanks are present) and the inside of the building. Electrical transformers were re-conditioned inside the Truck Shop in the 1980s by a company named Unison. A floor drain exits the Truck Shop with a discharge point to the ground surface approximately 600 feet to the northeast of the building. Several areas are present on the concrete floor where former floor drains have apparently been filled in with cement.

It is apparent that the Truck Shop was used for large equipment servicing and transformer storage, and thus represents a potential source for oils, gasoline, solvents, and PCB. Samples will be collected from around the building, especially in front of the overhead service doors.

Sample locations:

- one at each of the two service doors,
- one at each of two single-wide entrances,
- two in the area of the secondary containment,
- one in the dark-stained area at the northwest end of the building,
- one alongside the building where the floor drain exits, and
- one in the dark-stained area along the pipeline on the southwest wall.

Equipment Garage (L)

The Equipment Garage is located to the northeast of the Truck Shop (K), and is approximately 150 feet long by 65 feet wide (9,750 square feet). The building is constructed of metal walls and roof and concrete floor. There are six large overhead service doors along the southwest side of the building, and another overhead door at the southeast corner. Large equipment were serviced inside the building. The northeast corner of the building was occupied by an office. A small sump is located outside the building at the south corner. An area of dark-stained ground surface is apparent along the northeast side of the building. It is apparent that the Equipment Garage was used for vehicle and/or equipment servicing and storage, and thus represents a potential source for oils, gasoline, solvents, and PCB. Samples will be collected from around the perimeter of the building, especially in front of the overhead doors which represent areas where movement of materials in and out of the building occurred. A sample will be collected in the area of the dark-stained ground surface.

Sample locations:

- one from in front of the large overhead doors,
- one from next to the sump,
- one from in front of the southeast overhead door, and
- one from the area of dark-stained ground surface

Truck Wash and Paint Shop (M)

This building is located north of the Equipment Garage (L). It is approximately 45 feet by 45 feet (2,025 square feet), and is constructed of metal walls and roof and concrete floor. The building has two large overhead doors on opposing sides of the building where vehicles and equipment entered and exited. The building was used as a wash rack for equipment and stock. There was also apparently painting of equipment conducted inside the building, as the name implies. Some dark staining is apparent on the ground surface outside of the building overhead doors. A small sump exists outside at the north corner of building. The stained ground surface may indicate leaking oil, and old paint represents a potential source of lead. Samples will be collected from in front of the overhead doors which represent areas where movement of vehicles and equipment in and out of the building occurred. A sample will be collected in the area of the dark-stained ground surface.

Sample locations:

- one from in front of the rear overhead doors in the stained area,
- one from in front of the entrance overhead doors, and
- one from next to the sump

Carpenter Shop (N)

This building is northwest of the Truck Shop (K). It is approximately 70 feet by 40 feet (2,800 square feet) and is constructed of metal walls and roof and a concrete floor. There was an office and shop area. The southeast end of the building has overhead service doors. The shop is empty except for scrap supplies and a few tools and equipment. A small concrete sump with a valve is present outside the west wall of the building. There is no indication that the building was ever used for other activities other than for carpentry work. Thus, there is no reason to believe that any contaminants of concern were ever used or stored in the shop. However, a sample will still be collected from the sump area.

Lead Shop (O)

This building is north of the Carpenter Shop (N). It is approximately 20 feet by 40 feet (800 square feet), and is constructed of metal walls and roof, and a concrete floor. A large service door is on one side of the building, and a steel I-beam inside the building once supported a crane for lifting equipment and stock. The building was used as a lead shop, where it is likely that lead pipes were worked and perhaps lead pipe joints constructed. The shop is empty of any materials or equipment. Samples will be collected from in front of the large service door which represents an area where movement of materials in and out of the building occurred.

Sample locations:

- one from in front of the service door and
- two along the northeast and southwest sides of the building

Leach Vats (P)

Eight leaching vats, each 10 feet apart, are shown in Figure 4. Each vat measures120 feet by 135 feet by 20 feet deep, with an average 18-inch concrete walls and concrete floors, although the wall thickness is reported to range from one foot thick at the top to three foot thick at the bottom (DOI, 1958). The interiors of the vats were lined with asphalt mastic (30 percent asphalt and 70 percent sand, reinforced with two layers of thick wire mesh) to protect the concrete from deterioration by the sulfuric acid. The vats were used to percolate acid leach solution through the crushed ore from the Secondary Crusher (OO) and, subsequently, the application of rinse solution. Each vat was capable of processing 12,000 tons of crushed ore. The normal leaching time for each tank was 96 to 120 hours, followed by 48 to 76 hours of rinsing, ore removal and ore bedding. The leached solution containing copper from the Leach Vats was pumped to storage tanks (DD) east of the vats. From the tanks, the solution was sent to the Precipitation Plant (EE) where it was circulated over light gauge scrap iron to precipitate out the copper (Mining Congress Journal, 1961). The spent leach residue was removed from the vats using an excavator, and transferred to the “tailing dump at the northern end of the property”. It is reported that by June 1972, approximately 28,000 tons of crushed ore was being processed through the concentrators and leaching plant per day (Mining Review, 1972).

The robust construction of the vat walls and floors makes it unlikely that cracks ever developed completely through the structure. The interior of the vats will be inspected for such cracks, however, and if any are observed, these will be recorded and inspected. Samples will be collected along the perimeter of the structures, as close as possible to the vat walls, by drilling boreholes with a geoprobe, auger or drilling rig to a depth that corresponds to approximately 5 feet below the bottom of the vats. The potential contaminants of concern are the acid solution that was contained within the vats. Additionally, the vats were serviced by a permanent overhead rolling crane, which represents a potential source of leaking oil.

Sample locations:

- two corners of each vat and at the end of the vats

Quonset Hut (Q)

A quonset-style building and fenced-in storage yard are present north of the Administration Building. The building is approximately 100 feet long and 25 feet wide (2,500 square feet), and is constructed of metal. There is no floor in the building. The building and storage yard contain old scrap electrical supplies such as wire, switches, lights, and control equipment. The yard was formerly used to store transformers, and at least one old transformer is still present in the storage yard. The apparent use of this building was to store electrical equipment, which could have included transformers. Leaking transformers represent a potential source of oil and PCB. Samples will be collected from inside the building, on the dirt floor, and from around the storage yard at locations where equipment is currently stored.

Sample locations:

- one from inside the building on the dirt floor, and
- three from around the storage yard at locations where equipment is currently stored

Emergency Shed (R)

This building is approximately 50 feet long by 16 feet wide, and is constructed of metal walls and roof, with a concrete floor. The nature of past activities conducted inside the building is unknown, although the name suggests that "emergency" supplies were stored inside. These could include gasoline or diesel for generators. It is not likely that emergency supplies included acids, solvents, or other chemicals. The building is empty except for stored soil samples and scraps of materials. There is a 2-inch pipeline protruding from the ground near the southeast corner of the building. Samples will be collected from in front of the entrance. One of the samples will be collected from the soil surrounding the pipe.

Sample locations:

- one from in front of the entrance and
- one from next to the pipe

Sheet Metal Shop (S)

This building is located near the southwest corner of the Truck Shop (K), and is approximately 60 feet long by 35 feet wide (2,100 square feet). It is constructed of metal walls and roof, and a concrete floor. The building was used as a sheet metal fabrication shop. The building is empty except for scrap and debris on the floor. An attached shed on the east wall of the building is locked and labeled "Diesel". This shed may have stored fuel for portable equipment. There is no indication that the building was used for any purpose other than as a sheet metal shop. There is no reason to believe that any contaminants of concern, other than diesel fuel, may have been stored used in this shop. Samples will be collected from in front of the entrance, and around the diesel shed.

Sample locations:

- one from in front of the service entrance and
- one next to the diesel shed.

Storage Building (T)

This building is located southeast of the Sheet Metal Shop (S). It is approximately 25 feet by 30 feet (750 square feet), and is constructed of metal walls and roof, and a concrete floor. The building contains scrap piping and a portable generator. There is no indication that contaminants of concern were ever stored or used at this building.

Filling Stations (U, W, X)

One petroleum filling station (U) consists of two above-ground storage tanks that are not housed in a building. The tanks are currently being used to refuel vehicles. There is one 10,000-gallon tank in secondary containment consisting of an earthen berm and plastic liner, and a second tank of 1,000-gallon capacity with no secondary containment. A former petroleum filling station (W) has fuel pumps located in the station shed and two two-inch underground lines protruding from the ground outside the southeast end of the building, a possible indication of the presence of underground petroleum storage tanks. Another former gasoline filling station (X) is plastic-lined with pipes protruding from the ground and fuel pumps located in the station shed, a possible indication of the presence of underground petroleum storage tanks. These fueling stations represent a potential source for impact from diesel fuel and gasoline. Samples will be collected as close as possible to containment walls or tanks where no containment exists.

Sample locations:

- one from as close as possible to the containment wall and
- one near the tank where no containment exists

Grease Shop #2 (V)

This small storage building is approximately 15 feet by 18 feet (270 square feet) with metal walls and roof, and a concrete floor. The building was used for shop and storage activities, including, as the name implies, grease and lubricants. The small building contains dry scrap and debris. Stored lubricants and oils represent a potential source of PCB. Samples will be collected in front of the entrance, where movement of materials in and out of the building occurred.

Sample locations:

- one sample will be collected from inside the shed next to the pumps

Electrical Shop (Y)

This building is located directly northwest of the Sheet Metal Shop (S). It is approximately 70 feet long and 25 feet wide, and is constructed of metal walls and roof, and a concrete floor. The shop was used to store electrical equipment and supplies, and contains shelves full of wire, fittings, and devices. There are no containers of any liquids or chemicals inside the building. The small spacing of the aisles and shelves precludes the storage of any large transformers. There is no indication that any contaminants of concern were ever stored or used in this building.

Used Oil Tank (Z)

An 1,800-gallon used oil tank is present north of the Truck Shop. The tank is inside secondary containment, but some dark staining is apparent on the ground surface near the secondary containment. The stained ground surface represents a potential indication of used oil or solvents. One sample will be collected in the stained area next to the secondary containment.

Core building (AA)

The Core Building is located southwest of the Process Areas and contains several hundred boxes of core samples on shelves. The building is constructed of sheet metal on framework without a floor (i.e., a dirt floor). The building was constructed a relatively long distance (nearly ¼ mile) from the edge of the existing Process Area. There is no apparent indication as to the nature of prior operations or use of the building. Although shelving covers much of the floor space, no discoloration of the floor or surrounding ground surface is apparent. The distance from the Process Area, and the lack of a concrete floor, floor drains, plumbing, or any sign of mechanical structures suggests that the building was not used for repair, washing, or painting. Although there is no reason to believe that any contaminants of concern were ever stored or used at the building, the lack of a concrete floor raises the potential for impact to the surface if contaminants ever were stored there. Since the building has no floor, samples will be collected from within the building and from in front of the entrance where movement of materials in and out of the building occurred.

Sample locations:

- one from within the building and
- one from in front of the entrance where movement of materials in and out of the building occurred.

Water Tank (BB)

There is a single water tank located northwest of Yerington Pit and approximately 1,500 feet southwest of the Leach Vats. The tank was used to supply water for the mine and for Weed Heights, and is currently out of operation. The capacity and volume of water remaining in the tank is unknown. There is no reason to believe that any contaminants of concern were ever used or stored at this location.

Primary Crusher Foundation (CC)

The Primary Crusher was used to crush the ore to a five-inch product before being sent on to the Secondary Crusher, which reduced it to 0.5-inch diameter. A 54-inch Traylor gyratory crusher was use to crush the ore, and a 48-inch overhead conveyor belt routed the crushed ore to a storage bin alongside the crusher, before another 48-inch conveyor routed it to the secondary crusher. The overhead conveyors initially started below ground, and emerged from the ground next to the stockpile and the Primary Crusher; concrete structures may be buried below ground. All that remains of the Primary Crusher is the concrete foundation and walls. The area of the foundations is approximately 100 feet by 130 feet (13,000 square feet). Historical records indicate that ore crushing was the only activity at this component; there is no reason to believe that any contaminants of concern other than metals in the ore and lubricants such as oil for machinery parts were ever stored or used. Leaching did not occur at the crusher. Samples will be collected from around the crusher area, near foundations, especially where the actual crusher and conveyors were located.

Sample locations:

- one from around the crusher area next to foundations, and
- one from the area where conveyors apparently exited the crusher.

Solution Tanks (DD)

The Solution Tanks consist of concrete floors and concrete walls approximately 18 feet tall. These concrete tanks were used to temporarily hold the leached acid/copper solution from the Leach Vats (P) before being pumped into the Precipitation Plant launders (EE). The tanks are approximately 90 feet wide, and the length of all three tanks is approximately 360 feet. The southernmost Solution Tank was previously used to store chemicals or petroleum products in approximately 280 55-gallon drums and soils in nine plastic 250-gallon containers. Several of the drums were damaged, and some were labeled as containing PCBs. All of these drums have been characterized and removed (Appendix B). The interiors of the solution tanks will be inspected for cracks, and if any are observed, these will be recorded and inspected. If there is indication that cracks have developed through the structure, additional sub-structure sampling will have to be considered. For the initial investigation, surface samples will be collected along the perimeter of the structures, as close as possible to the tank walls. Both ends of the tanks and the spaces in between tanks will be sampled. The contaminants of concern used in this area were acid and the material stored in the 55-gallon drums.

Sample locations:

- eight samples will be collected at each of the corners of tanks, as close as possible to the tank walls.

Precipitation Plant (EE)

The Precipitation Plant consisted of fifteen parallel concrete launders filled with light gauge scrap iron that were used to precipitate copper from the sulfuric acid leach solution pumped out of the Leach Vats. The solution circulated in the launders for approximately 4 ¾ days, after which the precipitated copper was removed from the launders and transported to the railway at Wabuska for shipment to the smelter in Anaconda, Montana (Mining Congress Journal, 1961). The resulting ferrous sulfate solution from the launders was sent to “the evaporation area” where it was allowed to evaporate. A historical map indicates that the “evaporation area” was northwest and outside of the Process Area (DOI, 1958). Pregnant copper solution from dump leaching was also sent to the Precipitation Plant, but was kept separate from the Leach Vat solution. A historical diagram of the Precipitation Plant indicates that along the outside perimeter of the launders, several pumps and associated piping were constructed to convey stripping solution and spent solution, and recirculation sumps were located at the approximate midway point along one of the long sides of the plant, and at one end of the plant (Mining Engineering, 1967; Mining Review, 1972). Each launder measures 10 feet by 58 feet by five feet deep, with a 1.25 percent slope to facilitate flow from one launder to the next. The entire plant is approximately 600 feet long. The launders still contain some scrap iron. There were previously several 55-gallon drums stored in one of the launders at the southeast end of the plant; all of these drums have been characterized and removed (Appendix B). The interiors of the Precipitation Plant launders will be inspected for cracks, and if any are observed, these will be recorded and inspected. The existence of lead transfer pipes between launders will investigated by inspection of the bottom of each launder, and the observance of such transfer pipes will be recorded. For the initial investigation, surface samples will be collected along the perimeter of the structure, as close as possible to the concrete walls. The contaminants of concern used in this area were acid and the material that was stored in the 55-gallon drums.

Sample locations:

- Ten samples will be collected from along the sides of the plant, with the two southeast samples collected closer to the center where the former recirculation sump was located.

<u>Solution Tanks, Electrical Building and Basement (FF)</u>

This area is comprised of the electrical building that serviced (at least) the pumps for the solution tanks (DD) and the Precipitation Plant (EE), and an associated basement foundation of an unknown building. The area is approximately 60 feet wide by 200 feet long (12,000 square feet). There are switchgear present in the electrical building. Although there is no apparent oil staining, the potential for the past use of transformers in this building exists. The electrical service equipment for the Solution Tanks and Leaching Vats is out of service. The nature of operations in the building where the open basement foundation remains is uncertain. The potential contaminants of concern used in this area were acid solution and transformer oil. Samples will be collected along the perimeter of the electrical building and the open basement foundation.

Sample locations:

- one from alongside a concrete pad next to the electrical building,
- one from in front of the doorway, and
- two from around the perimeter of the open basement foundation

Sulfide Plant Office (GG)

This L-shaped concrete building is located northwest of the Solution Tanks (DD), and is approximately 50 feet by 25 feet along one wing, and 25 feet by 25 feet at the other (1,875 square feet). The office is empty with the exception of archived soil samples. The office was apparently used for ancillary administrative purposes related to sulfide plant (HH) operations. Although there is no reason to believe that any contaminants of concern were ever used or stored at this building, one sample will be collected from in front of the single-wide entrance.

Sulfide Plant (HH)

All buildings in the Sulfide Plant area have been removed, and only concrete structures remain. These concrete structures cover an area approximately 800 feet by 400 feet (320,000 square feet) and consist of foundations, slabs, columns, trenches, ramps and thickeners. Some of the structures, such as slabs and ramps, appear to be at and above surface, and some of the structures such as trenches and thickeners are partially buried. All of the circular-shaped thickeners have been filled with alluvial material. Two concrete-lined conveyor ways run from the bottom of the sulfide fine ore stockpile, underneath the road, and up into the Sulfide Plant. These conveyors are approximately 175 feet long (Figure 4). Sulfide ore from the Leviathan mine was crushed at the Secondary Crusher (OO) and conveyed on the same 1,521-foot belt used for oxide ore to the sulfide fine ore storage area. From the fine ore storage area, the crushed sulfide ore was conveyed to two rod mills within the Sulfide Plant area for fine grinding. The resulting discharge, as a slurry, was fed to a rough flotation circuit consisting of four concrete rows containing 24 separate cells. The resulting rough concentrate was routed to a 75-foot diameter thickener, then to a fine-grinding mill. From this mill, the concentrate was fed to a scavenger flotation circuit of similar construction to the first, then on to two 50-foot diameter thickeners. The final concentrate was dried in two six-foot diameter vacuum filters. The potential contaminants of concern used in this Sulfide Plant area are metals associated with the sulfide ore. Samples will be collected from 12 discrete locations throughout the plant area, including those areas that are identifiable as having contained or conveyed ore. If any areas of stained ground surface are observed, discrete samples will be collected from these areas.

Sample locations:

12 samples will be collected, including:

- six at former thickener tanks,
- three from an area where several small foundations exist,
- two from the center of the plant near a walled concrete structure, and
- one from a concrete structure at the south corner of the plant.

Concrete Ramps (II)

There are two sloped concrete ramps east of the Sulfide Plant that are approximately 25 feet wide by 50 feet long. The exact nature of their past use is uncertain, but it is possible that these ramps were used to back haul trucks up to for loading of sulfide ore that was transported to Wabuska for smelting. The potential contaminants of concern used in this area are metals associated with the sulfide ore.

Sample locations:

- a sample will be collected from the loading end of each ramp

Low Area (JJ)

This is an area located approximately 800 feet east of the Sulfide Plant at a lower elevation than the general ground surface at the Process Areas. The low area exhibits apparent runoff accumulation from the surrounding topography. The potential contaminants of concerns are those associated with the Sulfide Plant and possible runoff from areas of oil or solvent stained ground surface.

Sample locations:

- a sample will be collected from the lowest elevation in the area, where discolored ground surface is observed

Low Area (KK)

This is an area located approximately 800 feet east of the Sulfide Plant at a lower elevation than the general ground surface at the Process Areas. The low area exhibits apparent runoff accumulation from the surrounding topography. The potential contaminants of concerns are those associated with the Sulfide Plant and possible runoff from areas of oil or solvent stained ground surface.

Sample locations:

- a sample will be collected from the lowest elevation in the area, where discolored ground surface is observed

Drum Storage (LL)

The Tar Drum Storage area previously contained 23 drums of tar, some of which showed some leakage to the ground, outside of the northeast portion of the Equipment Garage (L). All of these drums have been characterized and removed (Appendix B). The total area of the tar storage is approximately 25 feet by 10 feet. Although the tar was hardened on the ground surface, a sample will be collected from below the tar leakage. The potential contaminants of concern are those associated with petroleum hydrocarbons in the heavy, less volatile range.

Truck Shop Floor Drain Outlet (MM)

The Truck Shop (K) floor drain runs underground from the Truck Shop to an open area to the northeast, indicated on Figure 4. Electrical transformers were re-conditioned inside the Truck Shop in the 1980s by a company named Unison. Several areas are present on the concrete floor of the Truck Shopwhere former floor drains have apparently been filled in with cement. It is apparent that the Truck Shop was used for large equipment servicing and transformer storage, and thus represents a potential source for oils, gasoline, and PCB. The drain outlet area is obvious, and samples will be collected from this area.

Stacker Area (NN)

This conveyance area between ore crushers has had all components removed, and has been re-graded. The potential contaminants of concern are associated with crushed ore, namely metals. Samples will be collected from this area based on the best knowledge of where the conveyance area was located.

Secondary Crusher Area (OO)

The Primary Crusher was used to crush the ore to a five-inch product before being sent on to the Secondary Crusher, which reduced it to a nominal $^{7}/_{16}$-inch diameter. The Secondary Crusher received the five-inch ore in two overhead screened feeders above the crushing unit, a Symons standard crusher. The $^{7}/_{16}$-inch minus crushed ore was fed to three 300-ton storage bins that sat atop the Secondary Crusher (Mining Congress Journal, 1961). The Secondary Crusher building is present to the west of the Primary Crusher area (CC). The Secondary Crusher cones along the north side of the building have been completely removed, but the concrete foundations remain. An underground concrete conveyor way exists underneath the Secondary Crusher cone foundations, between the Secondary Crusher and the ore stockpile just north of the Primary Crusher. Underground concrete conveyor ways (Figure 4) are also present between the Secondary Crusher area and just south of the Mega Pond. The potential contaminants of concern are metals associated with crushed ore. Samples will be collected from around the concrete foundation.

Sample locations:

- one alongside the cone crushers,
- one where the conveyor enters the crusher area,
- one near the transformer pad at the northwest end, and
- one along the southwest side

Acid Tanks (PP)

The acid tanks area is located approximately one mile northwest of the main Process Area. The inventory of acid tanks is summarized in Table 2. Currently, four above-ground acid tanks are located approximately 1,400 feet southwest of the Phase Four VLT Heap Leach (Figure 5). A

50,000-gallon metal sulfuric acid tank is situated within an earth-bermed, plastic-lined secondary containment area. Approximately 30 feet outside of the 50,000-gallon tank secondary containment, an approximate 10,000-gallon acid tank is laying on its side on the ground with chocks to prevent rolling. Two metal sulfuric acid tanks of approximately 5,000-gallon capacity are located approximately 70 feet northwest of the 50,000-gallon tank. These two tanks are situated in an earth-bermed, plastic-lined secondary containment. Soil within the secondary containment and at the end of an outlet pipe outside the secondary containment is yellow-colored. The contents of all the acid tanks have been drained, but the tanks have not been cleaned out. The volume of residual acid in the tanks is unknown. The contaminants of concern in the acid tanks area are sulfuric acid stored in the tanks. Samples will be collected from each of the tank areas, as close as possible to tank outlets where the potential for release (open valve) is greatest or where the yellow colored ground surface is apparent.

Sample locations:

- one from the perimeter of the secondary containment for the 50,000-gallon tank at a point closest to the valve connection,
- one from the lowest end of the tank laying on its side, and
- two from the perimeter of the secondary containment for the two other tanks at points closest to where discolored soil was observed

<u>Arimetco Crusher/Hopper (QQ)</u>

The Arimetco Crusher/Hopper was located approximately one mile northwest of the main Process Area, on the north side of the Oxide Ore Waste Rock area. The components have been removed and the area has been re-graded. The contaminants of concern in the area are sulfuric acid and metals associated with the crushed ore. Two samples will be collected from this area based on the best knowledge of where the crusher was located.

<u>Stacker Area (RR)</u>

A lined stockpile area existed on the area where the former Stacker was located, approximately one mile northwest of the main Process Area. Acid-treated crushed ore was placed on the stockpile area. After the Crusher Plant was removed, the stockpile area was excavated and placed on the VLT Leach Pad. The contaminants of concern in the area are sulfuric acid and metals associated with the crushed ore. Two samples will be collected from this area based on the best knowledge of where the stockpile area was located.

Former Acid Plant (SS)

The Acid Plant was located where the Phase III - South Heap Leach Pad is currently situated (Figure 4). Historic records indicate that the Acid Plant produced sulfuric acid solution as early as 1954, and continued production of approximately 200 to 450 tons of sulfuric acid per day until at least 1975 (Anaconda, 1954). Until 1971, sulfur mined at the Leviathan mine in Alpine County, California was brought 58 miles to the Yerington mine to make the sulfuric acid. When the supply of sulfur at Leviathan was depleted by 1971, the plant used 99 percent sulfur purchased from a supplier. The plant was capable of producing 100 percent sulfuric acid, but the acid was typically diluted to 93 percent for storage (Mining Congress Journal, 1961).

Crushed sulfur ore was introduced into propane gas reactors, where it was heated to approximately 1,100 degrees Fahrenheit to produce the sulfur dioxide gas. The heated gas entered cooling towers where it condensed to sulfuric acid. Dusts from the gas were removed by wet scrubbers, mist precipitators, and cyclones, and these were sent along with calcines (burned ore) from the reactors to the “evaporation area”, using the spent solution from the precipitation launders as a conveyance medium (DOI, 1958). The means of transport was a concrete ditch from the Acid Plant (Figure 4). Selenium was also recovered from the precipitated solids of the dust control process (DOI, 1958).

A former solution pond (XX shown on Figure 4) was located to the south of the Acid Plant, shown on a historical photo as containing a reddish-orange solution. There is no longer any surface expression on-site of the exact location of the pond.

The contaminants of concern in the former Acid Plant area are sulfuric acid and metals associated with the crushed sulfur ore, including the by-product selenium. Since the former plant is now underneath the leach pad and no structures are present, sample locations that represent the best estimate of where plant was will be very difficult, if not impossible, to estimate. Therefore, samples will not be collected from this area, but the potential for impact to groundwater will be evaluated by the installation of a down-gradient monitoring well.

Motor Cargo Building (TT)

The Motor Cargo Building is located northwest of the Core Building (AA), to the southwest of the former Acid Plant (SS). The city of Weed Heights operates the Motor Cargo Building and surrounding fenced-in storage yard for equipment and supplies storage. Several 55-gallon drums of unknown content were observed at the time of site reconnaissance inside the fenced storage yard. The exact nature of operations inside the building is uncertain. Previously, the building was used for parking and possibly repair of trucks that were used to transport oxides and chemicals to and from Wabuska for train shipment. Four samples will be collected from the area.

Sample Locations:

- two from the area where the drums were observed, and
- two from locations near the building, which will be based on further investigation

Old Crusher Site (UU)

A concrete foundation that exists approximately 2,100 feet southeast of the Administration Building (A) near the southeast corner of the Phase II Heap Leach Pad was a former crusher area. The foundation has no structures or equipment attached. Next to the foundation is an area where a former acid tank may have been located. The ground surface around the former tank area is discolored yellow. The contaminants of concern in this area are sulfuric acid and metals associated with crushed ore. Samples will be collected from around the former crusher foundation, and a discrete sample will be collected from the area of discolored ground surface.

Sample locations:

- one will be collected from around the perimeter of the area where a former tank may have been, in the area of discolored soil, and
- one from alongside the foundation..

Tailings Pump Houses (VV)

Two buildings containing large pumps and associated piping are located east of the Evaporation Ponds (Figure 2). The easternmost building was named the Tailings Pump House and contains two large pumps with approximate 16-inch diameter piping entering straight into the ground and underground out to the south. The other building consists of large pumps on a raised concrete deck, associated piping, and a concrete holding tank with level gauge. The previous operation of the Tailings Pump Houses most likely involved pumping of fluidized, spent processed ore from the Process Areas to the Sulfide Tailings area. The pumps in these buildings are large enough to represent a potential source of TPH-GRO contamination if there happened to be a continuous leak of lubricant oil. The contaminants of concern in this area are sulfuric acid and metals associated with tailings, and lubricant oil from the pumps.

Sample locations:

Two samples will be collected from each of the two buildings:

- The easternmost pump house samples will be collected from around and next to the large pumps and pipes.
- The other pump house samples will be collected from around the deck where the pumps are located, and from next to the outside walls of the holding tank

Former Calcine Ditch (WW)

In the former Acid Plant (SS), dusts from gas produced in the manufacture of sulfuric acid were removed by wet scrubbers, mist precipitators, and cyclones, and the resulting wet slurry was directed to four calcine launders – concrete troughs covered with steel plates. From the launders, the slurry was sent along with calcines (burned ore) from the Acid Plant reactors to the "evaporation area", likely along the calcine ditch, using the spent solution from the precipitation launders as a conveyance medium (DOI, 1958). The contaminants of concern in this area are sulfuric acid and metals associated with the conveyed calcines and the collected stack dust. The calcine ditch received these waste streams at the Acid Plant, and conveyed them to an evaporation area north of the Process Areas. The length of the ditch is approximately 3,200 feet. To provide a comprehensive characterization of the ditch, samples will be collected along the ditch at intervals of approximately 200 feet, including at the end of the ditch (Figure 4). The

1,200–foot portion of the ditch that is closest to the source, the former Acid Plant, is buried under a heap leach pad, and therefore will not be sampled.

Former Pond (XX)

A holding pond was located northwest of the former Acid Plant (SS). Because of the proximity of the former pond to the former Acid Plant, it is reasonable to believe that the pond was associated with the plant, perhaps to temporarily hold or evaporate fluid from the plant. However, the exact nature of the liquid that was held in the former pond is unknown. Since historical articles document conveyance of collected stack dust and spent ore from the plant reactors (calcines) along the Calcine Ditch (WW) to an area northwest of the Process Areas, the pond apparently did not contain calcines. Because the pond is buried beneath the heap, no sample will be collected.

Sulfide Ore Stockpile Area and Underground Conveyors (YY)

Two underground concrete conveyor ways exist from the former sulfide ore stockpile to the Sulfide Plant (HH). This stockpile of sulfide ore was used to supply the Sulfide Plant for processing through the flotation and concentration process. The contaminants of concern in this area are metals associated with the conveyed ore.

Sample locations:

- one from the former stockpile location, and
- one from the estimated end of the conveyors at the Sulfide Plant end of the conveyors

Surface Pumps Foundation (ZZ)

An above-ground concrete foundation exists just east of the middle Evaporation Pond in a low area near the northeast boundary of the mine site. The structure is a concrete holding tank approximately four feet deep with a grated inlet on the north side at ground surface, and openings in the top that suggest the presence of large pumps. The structure appears to have collected surface water or fluids from the surrounding topographic low area. The contaminants of concern near this structure are sulfuric acid and metals associated with surface runoff over tailings.

Sample locations:

- one from in front of the grated inlet

Concrete Pump Tank (AAA)

A large abandoned above-ground concrete tank is present east of Well WW-8 at the southern end of the Unlined Evaporation Pond (Figure 2). The tank is approximately 12 feet high and appears to have had pumps attached to an integral concrete platform above the tank. A manhole with an apparent former valve ahead of the tank is present approximately 60 feet to the south of the tank. The nature of the former operation of this tank and associated piping is unknown. The contaminants of concern are those associated with liquids that could have potentially have been contained in tank and conveyed along the piping. These include water, acidic solutions, or calcines if the piping is a continuation of the calcine ditch (WW). A sample will be collected from next to the manhole/valve.

Underground Utilities and USTs

Locations of underground utility lines, including sewer lines, acid lines, and spent solution lines were found on historical maps at the mine site. The various alignments of these underground utilities from each map were compiled onto the following maps: Figures 6, 6A, 6B, and 6C. Because the Process Areas have undergone changes over the years, some of these utility pipelines may no longer exist, and these figures may also not include all pipelines in the Process Areas. To determine which piping alignments still exist and their lateral extent, a backhoe will be used to excavate down to approximately three feet below ground surface at each map location where the end of a pipe is indicated. If no piping is encountered, the excavation will be backfilled and no sample will be collected. If piping is encountered, a sample will be collected from 6 to 12 inches directly beneath the bottom of the piping at the closest pipe junction or connection. The sample will be submitted to the laboratory for the Full Profile Analyses. The location, diameter, condition, compass alignment (direction pipe is heading), and other noteworthy observations of the piping will be recorded in the field notebook. If sample analysis results indicate that no impact to soil has occurred at the point of excavation, then no further investigative action will be necessary. If sample analysis results indicate that impact to soil from pipe leakage has occurred, or if holes or significant corrosion to the piping was observed, or if there is indication that the integrity of pipe junction points may be compromised, then further delineation and sampling would be required in subsequent phase(s) of investigation. According to historic site maps, there are approximately 65 locations where pipe terminations or ends of pipes may be present.

In those locations where there is a reasonable potential that UST(s) exist or existed, such as the former fueling stations or locations where 2-inch or larger diameter pipes are protruding from the ground, the presence or absence of UST(s) and associated piping will be confirmed. This confirmation will be accomplished through the combined use of industrial utility locating devices and backhoe excavation. If a UST is encountered, remedial action (excavation and removal of the tank and confirmation sampling) will not be conducted under this work plan, but will be conducted under a separate work plan. The UST location, size, general condition, type, and burial depth will be noted in the field notebook for use in future remedial activities. Additionally, if a UST is found, an attempt will be made to determine whether the tank contains any liquid. This will be accomplished by lowering of a measuring stick or tape into the tank through the protruding fill pipe or vent pipe, if present. The nature and depth of the liquid will be recorded in the field notebook.

Electrical Stations and Sub-stations

Several electrical sub-stations exist at the mine site, some of which have transformers that have leaked oil. There are at least 67 transformers on-site, either inoperative or still in use, mounted on poles or on concrete pads within fenced-in areas. The building foundation for the former Anaconda power station is partially buried just west of the Administration Building (A). The former Anaconda power station consisted of three one-megawatt generators that were sold when the station was decommissioned. The potential contaminants of concern at the electrical substations are those associated with leaking transformers, namely oil and PCB. Twelve samples will be collected (2 from each of six sub station locations). Samples will be collected as close as possible to the outside perimeter of transformer pads, where stained ground surface (if present) is visible.

Other Stained Soil Samples

During the field investigation, samples will be collected where additional areas where ground surface is stained or where other observed conditions in the field justify collection of a sample in a specific location. Limited excavation may be conducted to remove small areas of stained soil and to provide limited delineation of the extent of staining. In this case, two confirmation samples would be collected at the bottom of the excavation near sidewalls, to characterize the horizontal and vertical extent of soil remaining. The potential contaminants of concern at these potential structures is unknown at present. Samples will be submitted for full profile analyses.

SECTION 3.0
WORK PLAN

Atlantic Richfield proposes to conduct field investigations of soils associated with Process Areas components and related areas shown in Figures 2, 4, 4A through 4F, 5 and 6. These activities include sample collection and analyses of surface samples (zero to 12 inches below ground surface) at approximately 160 locations, excavation at approximately 65 underground utility locations, soil borings at approximately 10 locations, and underground storage tank confirmation at three locations. The areas of investigation covered under this Work Plan include, but are not limited to:

- Buildings used for maintenance shops, offices, storage, laboratory work, skilled crafts shops, and other ancillary uses;
- Surface and subsurface concrete structures, including foundations slabs, and sumps;
- Above-ground and underground storage tanks;
- Underground Utilities throughout the Process Areas;
- Areas where solutions may have escaped containment including, but not limited to, discolored soils.

Locations for sample collection of soils and alluvium will be based on the following criteria:

- Close proximity to doorways and entrances of buildings where ingress/egress of people, materials, and equipment would have occurred.
- Sumps and pumps;
- Areas where discolored or odorous soils are observed;
- Close proximity to areas where recorded, alleged or apparent spills or releases occurred; and
- Close proximity to areas where past activities were conducted that represent a potential source for impact to soil or ground water.

The Process Area components and the proposed sampling locations are described in Section 2. Each component is assigned an alpha letter designation to identify it on maps. The sampling schedule (Table 1) details the number and type of samples at each component or sampling location, corresponding to Section 2 designations and descriptions. The sampling locations at each component are shown on site maps as Figures 2, 4, 4A through 4F, 5, and 6. The underground utility excavation locations are shown in Figures 6, 6A, 6B, and 6C. The final number and precise location of collected samples in the field may ultimately differ slightly from the proposed number and locations because of modifications in the field on the basis of observed site conditions at the time of the field investigations or because of requests from regulatory agencies. Examples of such observed site conditions are topographic low areas, discolored soil, open ends of pipes, or other conditions which represent potential locations for contaminants of concern. Each final soil sample location will be presented on a map in the Data Summary Report.

The initial field investigation includes collection of discrete surface samples from 0 to 12 inches below ground surface. Laboratory results from surface sample analyses will be compared to analytical trigger levels (Table 5) to determine if additional sampling is required to delineate the vertical or horizontal extent of impacted soil. If the analytical trigger levels are not exceeded for a particular Process Area component, then no additional field investigation or samples would be required at that component.

Although preliminary analytical trigger levels have been proposed (Table 5), background soil values or other criteria may ultimately be decided upon through discussions with NDEP, EPA and BLM. Background concentrations will be established by review and assessment of laboratory results from locations that include the Waste Rock and Cover Materials areas. Also included in the review and assessment will be background values for EPA sample BK-1, also provided in Table 5. Final analytical trigger levels for radionuclides (uranium, radium-226, and radium-228) will be determined based on background values established by site-wide sampling and discussions with the regulatory agencies.

Areas that represent potential for subsurface impact include underground utility and process pipelines and concrete containment structures. Underground utilities and process pipelines will be investigated by sub-surface excavation at points where maps indicate pipe alignment terminations. In addition, the Leach Vats, which are partially underground, will be investigated by borings and sampling. These procedures are described in more detail in Section 3.1.

In accordance with EPA Guidance Document EPA QA/G-5S, “Guidance on Choosing a Sampling Design for Environmental Data Collection”, the judgmental sampling program described in this Work Plan is based on our current knowledge of the site and historic process operations. Such knowledge consists of a thorough review of all mine site records, researching relevant information at the Mackay School of Mines library and, in part, archived records stored at the University of Wyoming. Sample locations were based on professional judgement for the purpose of regulatory and/or remedial action, and not on random spatial design or grids for the purpose of confidence levels or probability.

The result is a comprehensive sampling of locations where soil contamination was most likely to occur (e.g., in front of doorways and entrances, near pumps and sumps, stained or topographically depressed areas, near holding tanks and secondary containment). Atlantic Richfield believes this biased sampling program will evaluate “worst-case” conditions and is appropriate because: 1) relatively small-scale components in the Process Area are under investigation; 2) in most cases, significant historical and physical information is available for each component; and 3) the objective of the investigation is to screen the Process Areas for the presence or absence of contamination at levels of concern to human health and the environment.

Three groundwater monitoring wells will be installed at the proposed locations shown on Figure 7. Laboratory results from collected groundwater samples will be compared to other site monitoring wells and background values, to be established in conjunction with the regulatory agencies. The installation and monitoring of groundwater monitoring wells for the Process Areas is addressed in Section 3.1 and in the Groundwater Conditions Work Plan.

3.1 Field Investigations

Field activities will consist of the following:

- Measurements or estimates of building and structure dimensions;
- Inventory of building and structure materials, and contents;
- Collection and submittal of surface soil samples for laboratory analyses;
- Determination if subsequent additional samples are required to delineate extent of impact;
- Excavation and removal of stained soil where practicable, and confirmation sampling;
- Confirmation of the presence or absence of USTs at former fueling stations and determination of type and quantity UST contents;
- Delineation of underground utilities and associated sub-surface sampling;
- Sub-surface boring and sampling;
- Installation and monitoring of groundwater monitoring wells;
- Documentation of sample locations and field sampling activities; and
- Photographs of structures, excavations and soil sample areas.

<u>Building and Structure Dimensions</u>

Existing buildings and structures will be photographed as a surveyors' scale is held alongside each building, to estimate the height. Building plan dimensions will be estimated from aerial photographs. Where possible, building measurements will be obtained.

<u>Inventory of building and structure materials, and contents</u>

An inventory of contents will be conducted in the field for each building or structure. The interior of each building will be inspected for stored materials and mechanical equipment. The general construction of buildings and structures will be noted and recorded. Section 2.2 provides information on historical operation at individual components, along with a physical description and rationale for the number and type of analyses for contaminants of concern.

<u>Soil Sampling</u>

Surface soil samples will be collected in accordance with the agency-approved QAPP and as described in Table 1 and shown on Figures 2, 4, 4A through 4F, 5, and 6. Building outlines and sample locations in Figures 2, 4, 4A-4F, 5, and 6 may appear on more than one of the figures.

The sample locations shown in these figures are, by nature of the map scale, approximate, and may be adjusted in the field in accordance with specific site conditions or by regulatory agency request. Sample locations identified in this Work Plan are based on professional judgement for the purpose of regulatory and/or remedial action, and not on random spatial design or grids for the purpose of confidence levels or probability. As such, the most likely locations for the presence of contamination were selected.

The sample locations are typically overhead doorways and single-wide entrances to buildings where materials were transferred in and out, sumps and pumps, alongside secondary containments, former storage areas, and areas of stained soil. When samples are collected in front of doorways near the sides of buildings (when no apparent staining is present), the protocol will be to collect a sample in the lowest topographical area, since this is the most likely place for accumulation of potential contaminants. If no such low area is apparent, the sample will be collected from in front of the center of the doorway. Other low areas throughout the Process Areas also represent locations where potential pooling of liquids could have occurred; these areas will be specifically sampled.

In general, soil samples will be collected by hand auger or shovel except where hard surface conditions necessitate use of a backhoe. Initially, surface samples will be collected from a depth of zero to 12 inches below ground surface. Laboratory results from surface sample analyses will be compared to work plan action levels to determine whether subsequent investigation for subsurface samples is required to spatially delineate impacted soil.

All collected samples will be discrete, from 6 to 12 inches below ground surface unless noted otherwise (e.g., underground utilities). If discolored or odorous soil has been observed, this soil will be excavated and removed (up to five feet in diameter and three feet deep), and stockpiled pending analytical results. Confirmation samples will be collected from these excavations where stained soil was located.

Unless noted otherwise in this Work Plan, all samples collected at all sample locations will be submitted to the laboratory for the "Full Profile Analyses", which include the constituents of concern listed in Table 3 (volatile compounds to be analyzed as listed in Appendix C). Although there is no indication or information that suggests that all of the constituents of concern would be present at any individual sample location, this comprehensive analysis approach will provide the most conservative results where historical information is lacking. The Full Profile Analyses, for the purpose of this Work Plan, includes:

- Inorganics/Metals - Whole rock (WRA)
- Volatile Organic Compounds (VOC)
- Semi-Volatile Organic Compounds (SVOC)
- PCB
- Total Petroleum Hydrocarbons –
- Diesel range and Gasoline range organics (TPH-D, TPH-G)
- Lead
- Pesticides (OP)
- Herbicides (CH)

Analyses for selected soil samples associated with process fluids will include uranium, radium-226, and radium-228. Atlantic Richfield understands that the regulatory agencies may wish to develop a separate "radionuclide work plan" for the entire site. Given the importance of fully understanding the distribution of technically-enhanced naturally-occurring radioactive materials (TENORM) at the site, this Work Plan provides for significant radionuclide analyses from those process components where such contamination may have occurred in the past (i.e., locations where process solutions were used, stored and conveyed).

<u>Stained Soil.</u>

Locations where stained surface soil was observed in the Process Areas have been indicated in Table 1. Stained soil may also be present in other locations that were not observed during site reconnaissance, as indicated in Table 1. The protocol for all locations where stained soil is apparent is to delineate the vertical and lateral extent of the staining, with limited excavation to three feet in depth and five feet in diameter. Excavated stained soil will be removed and stockpiled in the Carpenter Shop (N) or in an area(s) acceptable to the regulatory agencies. A proposed area for this purpose is shown on Figure 6. The stockpile(s) will be lined and covered with heavy-gage plastic. A lined soil berm will encompass the stockpile to control precipitation run-on and run-off. In some locations, such excavation may result in complete removal of all apparent stained soil. Stockpiled soil will be characterized for removal or disposal. The stockpiled soil will be removed or disposed of within 30 days from the completion of excavation work.

This limited excavation is part of the initial phase of the work plan investigation, and is not intended as a remedial action. More extensive delineation or excavation of stained soil would be conducted, if necessary, in subsequent phase(s) of investigation. All excavating will be conducted with a backhoe. Two samples will be collected directly from the bottom of excavations near the sidewalls, to characterize remaining soil in both the vertical and horizontal direction. Samples will be collected using decontaminated sampling equipment, single-use scoops, or other sampling devices, in accordance with the QAPP.

<u>Underground Utilities, Vats, and Tanks.</u>

The exact presence and location of underground utilities across the Process Areas is uncertain. Process Area maps archived at the mine site were reviewed to provide historical locations of piping for process fluids, sewer, drains, and fuel. These piping alignments are shown in Figures 6, 6A, 6B, and 6C. To determine which piping alignments still exist and their lateral extent, a backhoe will be used to excavate down to five feet below ground surface at each map location where the end of a pipe is indicated. At buildings, excavation will occur where the pipe enters the building. Otherwise, excavation will occur at the terminations of pipes in the field. If piping is encountered, at each excavation a sample will be collected from 6 to 12 inches directly beneath the bottom of the piping at the closest pipe junction or connection.

The sample will be submitted to the laboratory for the Full Profile Analyses. If analytical results indicate that no constituents of concern were detected, then no further action will be required. If analytical results indicate that the analytical trigger level for a particular constituent of concern has been exceeded, then further investigation may be required. If analysis results indicate that the concentration for constituent(s) of concern have been detected at some concentration between non-detect and the analytical trigger level, then discussion on a further course of action will be conducted by Atlantic Richfield and the regulatory agencies and no further investigations will be necessary. Such discussion will consider both the concentrations and types of constituents detected. If no piping is encountered, the excavation will be backfilled and no sample will be collected.

The location, diameter, condition, compass alignment (direction pipe is heading), and other noteworthy observations of the piping will be recorded in the field notebook. Based on the information gathered, a new map will be generated showing the estimated piping alignments of actual piping located in the field, together with the information from the field notebook, indicated above.

In those locations where there is a reasonable potential that UST(s) exist or existed, such as the former fueling stations or locations where 2-inch or larger diameter pipes are protruding from the ground, the presence or absence of UST(s) and associated piping will be confirmed. This confirmation will be accomplished through the combined use of industrial utility locating devices and backhoe excavation. If a UST is encountered, remedial action (excavation and removal of the tank and confirmation sampling) will not be conducted under this Work Plan, but will be conducted under a separate work plan. The UST location, size, general condition, type, and burial depth will be noted in the field notebook for use in future remedial activities.

Additionally, if a UST is found, an attempt will be made to determine whether the tank contains any liquid. This will be accomplished by lowering of a measuring stick or tape into the tank through the protruding fill pipe or vent pipe, if present. The nature and depth of the liquid will be recorded in the field notebook. If liquid is present, an attempt will be made to collect a sample by use of a disposable bailer or decontaminated suction hose.

The soil surrounding the partially-subsurface Leach Vats (P) will be investigated by drilling boreholes along the perimeter of vats (Figure 4) to a depth of approximately five feet below the bottom of the vats. A 12-inch interval sample will be collected using a split-spoon sampler. The resulting soil from drill cuttings will be stockpiled in the Carpenter Shop (N) or at a stockpile site requested by regulatory agencies.

Installation, Monitoring, and Sampling of Groundwater Monitoring Wells

Three monitoring wells will be installed to monitor groundwater quality and elevations in and around the Process Areas. A first phase of groundwater monitoring will be accomplished by installing three wells (PAMW-1, PAMW-2, PAMW-3) to: 1) triangulate groundwater flow direction and gradient; 2) collect groundwater quality data up-gradient and within the Process Areas (immediately down-gradient of mapped underground utilities; and 3) collect groundwater quality data from a down-gradient location that is as close as possible to the buried former acid plant (without compromising the integrity of the overlying heap leach pad). Based on the flow direction relative to the Process Areas and existing wells, and laboratory results for water quality from those wells, the locations of additional monitoring wells would be determined, and these wells would be installed subsequent to the initial three monitoring wells. The resulting network of monitoring wells will provide a groundwater monitoring system for the Process Areas.

Preliminary well designs call for a 20 foot screen (5 feet above and 15 feet below the top of the groundwater table encountered during drilling), blank casing from the top of the screen to approximately 3 feet above ground surface and annular materials in accordance with State regulations. Discussions with the regulatory agencies prior to well construction will be conducted to finalize the well designs. Groundwater elevations and groundwater samples will be collected from groundwater monitoring wells in accordance with the site QAPP. Monitoring wells will be purged with either a submersible pump, decontaminated between wells, or with a single-use disposable bailer, depending on the depth to groundwater and the volume of static water column in the well. Samples will be collected with a disposable bailer and labeled, stored, and transported in accordance with the QAPP. The analysis methods and detection limits for groundwater samples are provided in Table 4. Groundwater sample analyses will include uranium, radium-226, and radium-228.

Documentation

All field investigation activities and procedures will be documented in the field notebook during the investigation. Documented activities will be dated and time-referenced, and inscribed on permanently bound and numbered pages. Documented activities include, but are not limited to:

- Sample location descriptions and photograph of each location;
- Sample depth intervals;
- Sample weights;
- Sample identification numbers (including QA/QC);
- Surface soil description;
- Observed conditions of site and structures;
- Weather conditions;
- Excavation dimensions;
- Sample collection procedures.

3.2 Quality Assurance and Quality Control

Procedures for sample collection and analysis will follow the specifications and procedures described in Section 3.2, including quality assurance/quality control (QA/QC) methods. These procedures, presented in the agency-approved Quality Assurance Project Plan (QAPP; Brown and Caldwell, 2002b) will ensure that the type, quantity, and quality of data collected are consistent with the DQOs listed in Section 1.4. QA/QC issues for this Work Plan include:

- Appropriate detection limit and laboratory analytical level requirements;
- Appropriate levels of precision, accuracy, and comparability for the data;
- Appropriate quality control protocols (e.g., sample collection, handling, transport, instrument calibration); and
- Appropriate quality assurance protocols (e.g., blanks and duplicate samples).

Sample Collection and Handling

The following describes, in general terms, quality control procedures for collection of surface samples within the Process Areas. A detailed description of sample collection and handling procedures is presented in the QAPP. A copy of the QAPP will be carried in the field by field investigation personnel, to refer to for proper QA/QC and sample collection, handling, and analysis procedures.

Collected samples will be placed in containers appropriate for each analysis. Containers for solids samples will be supplied from the laboratory to which the samples will be sent for analysis. All soil samples to be analyzed will be immediately labeled and placed into iced coolers for transport under chain-of-custody to a Nevada-certified analytical laboratory. Soil data, sample collection intervals, and other observed surface conditions will be recorded on the appropriate excavation log during the investigation. Soil data will include soil color, moisture content, consistency, and a visual estimate of Unified Soil Classification.

Sample collection protocol for the work plan and the QAPP has been developed in accordance with the following documents:

- EPA Region 9 “Sampling and Analysis Plan Guidance and Template Version 2, Private Analytical Services Used; R(QA/002, April 2000”
- EPA Region 9 Letter of Memorandum “Regional Interim Policy for Determination of Volatile Organic Compound (VOC) Concentration in Soil and Solid Matrices”.

Soil samples for VOC and SVOC analysis will be collected without disturbing the natural formation of the soil from excavation to the sample container. This collection method of keeping the soil formation intact will require using either a devoted collection device designed specifically for such purpose (e.g., 25 gram Encore sampler) where soil conditions allow, or by a coring tool and careful placement of the intact sample into a sealed container. Use of devoted collection devices such as the Encore may be precluded by gravelly or very hard surface conditions, and the latter method may have to be used.

Decontamination

Disposable scoops or plastic trowels will be used wherever possible, or sampling equipment will be decontaminated between each sampling location. All re-usable sample collection and mixing equipment will be washed in a solution of environmental grade detergent and distilled water, and rinsed in distilled water. The decontamination wash would be accomplished with clean buckets, filled half to three-quarters full as follows:

- Bucket 1: Tap water with non-phosphate detergent such as Alconox
- Bucket 2: Clean tap water or distilled water.
- Bucket 3: Clean tap water or distilled water.

Equipment decontamination consists of the following general steps:

- Removal of gross (visible) contamination by brushing or scraping.
- Removal of residual contamination by scrub-washing in Bucket #1, rinsing in Bucket #2, then rinsing in Bucket #3. Change the water periodically to minimize the amount of residue carried over into the third rinse.

All washing and rinsing solutions are considered investigation derived waste and will be placed in containers. After use, gloves and other disposable PPE should also be containerized and handled as investigation derived waste.

Duplicate Samples and Blanks

Duplicate samples will be collected at a frequency of one per every 10 samples for each analysis. Duplicate samples will be collected by filling the containers for each analysis at the same time the original sample is collected. In general, duplicate samples will be collected in the same manner as regular samples. For quality assurance purposes, duplicate samples will be labeled in the same fashion as regular samples, with no indication that they are QC samples. Each sample from a duplicate set will have a unique sample number labeled in accordance with the identification protocol (refer to QAPP), and the duplicates will be sent “blind” to the lab.

In general, equipment rinsate blanks will be collected when reusable, non-disposable sampling equipment (e.g., water level probe) are being used for the sampling event. A minimum of one equipment rinsate blank is prepared each day when equipment is decontaminated in the field.

Equipment rinsate blanks will be collected to evaluate field sampling and decontamination procedures by pouring laboratory-grade, certified organic-free water over the decontaminated sampling equipment. One equipment rinsate blank will be collected per matrix (e.g., soil, groundwater, etc.) each day that sampling equipment is decontaminated in the field. Equipment rinsate blanks will be obtained by passing water through or over the decontaminated sampling devices used that day. The rinsate blanks that are collected will be analyzed for the same analytes as normal samples. The equipment rinsate blanks will be preserved, packaged, and sealed in the manner described in the QAPP. A separate identification sample number will be assigned to each rinsate blank, and it will be submitted blind to the laboratory.

Field blanks will be collected to evaluate whether contaminants have been introduced into the samples during the sampling procedures. For soil or sediment samples, field blanks will be created by transferring a known source of uncontaminated solid (e.g., commercial sterilized soil) into a sampling container at one of the sampling points. Field blanks will be collected at a frequency of one per every 20 samples, with a minimum of one blank for less than 20 samples.

The exact same collection procedures will be used for the preparation of field blanks as was used for regular sampling. The field blanks that are prepared will be analyzed for the same analytes as regular samples. The field blanks will be preserved, packaged, and sealed in the manner described in the appropriate section for the type of medium being prepared. A separate identification sample number will be assigned to each blank, and it will be submitted blind to the laboratory.

Trip blanks will be prepared to evaluate if the shipping and handling procedures are introducing contaminants into the sample stream and if cross contamination in the form of migration has occurred among the collected samples. Soil and sediment trip blanks will be prepared by transferring a known source of clean, uncontaminated solid into a four-ounce jar, and sealing the lid. The sealed trip blanks are not opened in the field and are shipped to the laboratory in the same insulated chest with the regular samples collected for analyses. The trip blanks will be preserved, packaged, and sealed in the manner described in the QAPP for the type of medium being prepared. A separate identification sample number will be assigned to each trip blank and it will be submitted blind to the laboratory. Trip blanks will be collected at a frequency of one per sampling event per type of matrix, whether that event occurs over one day or several days.

Sample Identification and Preservation

Sample labels will be completed with a permanent waterproof marker and attached to each laboratory sample container before each sample is collected, and will include the following information:

- Sample identification
- Sample date
- Sample time
- Sample preparation and preservative
- Analyses to be performed
- Sample substance type
- Person who collected sample

Each sample will be tracked according to a unique sample field identification number assigned when the sample will be collected. This field identification number will consist of three parts:

- Sampling event sequence number
- Sampling location
- Collection sequence number

For example, the sample collected during the third sampling event at the fourth location at the Truck Shop sampled would be labeled: 003TS004. Blanks and duplicate samples will be labeled in the same fashion, with no indication of their contents. For example, the duplicate sample to the one stated above might be labeled: 003TS006, with documentation in the field notebook that 003TS006 is the duplicate to 003TS004.

Sample Handling and Transport

The QA objectives for the sample-handling portion of the field activities are to verify that decontamination, packaging, and shipping are not introducing variables into the sampling chain that could render the validity of the samples questionable. In order to confirm these QA objectives, blank QC samples will be used as described above. If the analysis of any QC samples indicates that variables are being introduced into the sampling chain, then the samples shipped with the questionable QC sample will be evaluated for the possibility of contamination.

Each collected sample container will be labeled, sealed with a custody seal, sealed in a zip-loc© bag, logged on a chain-of-custody form, and placed in a cooler with ice. Contained ice will be double bagged in zip-loc plastic bags. The ice chest will be sealed shut with strapping tape and two custody seals will be placed on the front of the cooler so that the custody seals extend from the lid to the main body of the ice chest. If the ice chest is sent by mail, the chain of custody form and other sample paperwork will be placed in a plastic bag and taped to the inside of the ice chest lid, and the ice chest will be labeled with “Fragile” and “This End Up” labels. The samples will be delivered to a laboratory to ensure that holding times will not be violated. Each chain-of-custody will contain the following information:

- Project name
- Sampler’s name and signature
- Sample identification
- Date and time of sample collection
- Sample matrix
- Number and volume of sample containers
- Analyses requested
- Method of shipment

For soil or sediment samples collected for whole-rock analysis, each sample will be collected in zip-loc bags or a five-gallon bucket that will be sealed thoroughly around the lid with tape and labeled with similar QA/QC procedures described for other soil sample labeling and packaging prior to shipment to the analytical laboratory.

3.3 Laboratory Analyses

Solid media samples will be analyzed in accordance with the following protocols, which are summarized in Table 3.

Soil Analyses

Collected soil samples will be analyzed by a Nevada-licensed laboratory. Soil analyses and proposed detection limits are listed in Table 3. Collected soil samples, unless noted otherwise, will be submitted for the "Full Profile Analyses" which consists of the following analyses:

- Inorganics/Metals: Whole-Rock Geochemical Analysis (WRA)
- Volatile Organic Compounds (VOC) by GC/MS Capillary Column; Method 8260B;
- Semi-volatile Organic Compounds (SVOC) by GC/MS Capillary Column; Method 8270C;
- Organochlorine Pesticides (OP) (PCB) by Cap Column GC; Method 8082;
- Chlorinated Herbicides (CH) by GC Cap Column; Method 8151A;
- Total Petroleum Hydrocarbons (TPH) as Gasoline Range Organics (GRO) or Diesel Range Organics (DRO)by GC/FID; Method 8015B-GRO, DRO.

Additionally, selected soil and groundwater samples will be submitted for analyses of uranium, radium-226, and radium-228.

- Soil sample minimum quantities for each analysis are specified in the QAPP.

3.4 Field Documentation

Summary of field measurement and sampling activities will be recorded in a bound site logbook, and entries must contain accurate and inclusive documentation of project activities. Entries will be made using permanent waterproof ink, and erasures are not permitted. Errors will be single-lined out, should not be obscured, and initialed and dated. The person making the entries will sign at the beginning and the end of the day's entries, and a new page will be started for each day.

The following entries will be made to the bound site logbook and/or filed log sheets:

- General descriptions of weather conditions
- Location of each sampling point
- Data and time of sample collection (field log sheets.)
- The type of blank collected and the method of collection
- Field measurements made, including the date and time of measurements
- Calibration of field instruments
- Reference to photographs taken
- Date and time of equipment decontamination
- Field observations and descriptions of problems encountered
- Duplicate sample location

Photographs will be taken at each field measurement/sampling point. The photo location and number will be recorded on the field log sheets. In addition to the logbook, an inventory of observed or reported chemicals would be conducted during the site investigation. The inventory would record the type of substance (phase and name, or unknown), type of container, and estimated quantity. The sample location coordinates will be recorded via GPS instruments at the time of sampling, or will be staked with identification for GPS surveying at a later time.

3.5 Site Job Safety Analysis

A site-specific Job Safety Analysis (JSA) will be prepared for the Process Areas investigative field work, in accordance with Atlantic Richfield Health and Safety protocol and the Yerington Mine Site Health and Safety Plan (SHSP; Brown and Caldwell, 2002c). The SHSP identifies, evaluates, and prescribes control measures for safety and health hazards, in addition to providing for emergency response at the Yerington Mine site. SHSP implementation and compliance will be the responsibility of Brown and Caldwell. Any changes or updates will be the responsibility of Brian Bass with Brown and Caldwell, with review by Atlantic Richfield Safety Representative Lorri Birkenbuel. Three copies of this plan will be maintained. One copy will be located at the site, one copy will be located in Atlantic Richfield's Montana office, and one copy will be located in the Brown and Caldwell office. The SHSP includes:

- Safety and health risk or hazard analysis;
- Employee training records;
- Personal protective equipment (PPE);
- Medical surveillance;
- Site control measures (including dust control);
- Decontamination procedures;
- Emergency response; and
- Spill containment program.

The SHSP also includes a section for site characterization and analysis that will identify specific site hazards and aid in determining appropriate control procedures. Required information for site characterization and analysis includes:

- Description of the response activity or job tasks to be performed;
- Duration of the planned employee activity;
- Site accessibility by air and roads;
- Site-specific safety and health hazards;
- Hazardous substance dispersion pathways; and
- Emergency response capabilities.

All contractors will receive applicable training, as outlined in 29CFR 1910.120(e) and as stated in the SHSP. Copies of Training Certificates for all site personnel will be attached to the SHSP. Personnel will initially review the JSA forms at a pre-entry briefing. Site-specific training will be covered at the briefing, with an initial site tour and review of site conditions and hazards. Records of pre-entry briefings will be attached to the SHSP.

Elements to be covered in site-specific briefing include: persons responsible for site-safety, site-specific safety and health hazards, use of PPE, work practices, engineering controls, major tasks, decontamination procedures, emergency care routes, and emergency response. Other required training, depending on the particular activity, may include MSHA 40-hour training and annual 8-hour refresher courses. Other training may include, but is not limited to, competent personnel training for excavations and confined space, first aid, and cardio-pulmonary resuscitation (CPR). Copies of the 40-hour and annual refresher certificates for site personnel will be attached to the SHSP.

The individual JSA for the Process Areas work incorporates individual tasks, potential hazards or concerns associated with each task, and the proper clothing, equipment, and work approach for each task. The following table summarizes the steps and potential hazards described in the Process Areas JSA, provided in Appendix A:

Sequence of Basic Job Steps	Potential Hazards
1. Pre-Construction Safety Meeting.	
2. Sample location setup backhoe	1. Drilling or digging into underground utilities 2. Striking overhead lines or objects with drill mast or backhoe boom.
3. Soil sampling: Backhoe excavation and borehole drilling	1. Injury to hearing from noise. 2. Inhalation hazards from dust from drilling or excavation activities. 3. Physical injury from moving parts of machinery. 4. Physical hazards to personnel on the ground in the vicinity of the heavy machinery. 5. Hazard from being in or near excavation.
4. Prepare sample containers and dress in appropriate PPE.	1. Burn or corrosion from acid spillage, if sample bottles require addition of acid or have acid already in them.
5. Collection of soil sample by hand and decontamination of equipment.	1. Skin irritation from dermal or eye contact. 2. Slipping or falling on concrete structures- sharp rock and protruding objects. 3. ENCOUNTERING CONTAINERS WITH SEALED AND UNLABELED CONTENTS ---UNKNOWN !!!! POTENTIAL FOR EXPLOSION OR INHALATION OF POISONOUS VAPOR OR DUST.
6. All Activities	1. Slips, Trips, and Falls due to lack of visibility (e.g., insufficient light), poor housekeeping, improper routes, faulty equipment, or slippery surfaces.
7. All Activities	1. Back injuries during manual handling of materials due to improper load weight and position, repetition, or improper bending of knees. 2. Hand injuries during manual handling of materials due to lack of or improper gloves, sharp edges, slippery surfaces, pinch points, or incompatible substances. 3. Foot injuries during manual handling of materials due to falling objects, pinch points, or spills.
8. All Activities	1. Heat exhaustion or stroke due to high ambient temperature, improper clothing, lack of ventilation, lack of water, or lack of shade.
9. All Activities	1. Hypothermia or frostbite due to low ambient temperature, improper clothing, damp or wet clothing, or lack of source for heat.
10. Unsafe conditions.	1. All potential hazards including but not limited to classified hazardous locations, sudden or unexpected unsafe conditions (fire, chemical release, natural disasters), or confined spaces.

SECTION 4.0
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